

What is claimed is:

1. A method of supplying power to at least one cooling system component, the method comprising:

5 determining an operating level threshold for the at least one cooling system component, wherein the operating level threshold is one of a plurality of operating levels for the at least one cooling system component; and

supplying power to meet the power demand of the at least one cooling system component using one or more of a primary power system and a secondary power system based on whether an operating level of the at least one cooling system component exceeds the operating level threshold.

2. The method of claim 1, wherein supplying power to meet the power demand of the at least one cooling system component using one or more of a primary power system and a secondary power system based on whether an operating level of the at least one cooling system component exceeds the operating level threshold further comprises:

supplying power to meet the power demand of the at least one cooling system component using both the primary power system and the secondary power system in response to the operating level of the at least one cooling system component exceeding the operating level threshold; and

supplying power to meet the power demand of the at least one cooling system component using the primary power system in response to the operating level of the at least one cooling system component being below the operating level threshold.

3. The method of claim 2, wherein supplying power to meet the power demand of the at least one cooling system component using both the primary power system and a secondary power system in response to the operating level of the at least one cooling system component exceeding the operating level threshold further comprises:
- 5 determining whether power is available from the secondary power system; and
supplying power using both the primary power system and the secondary power system in response to power from the secondary power system being available.
- 10 4. The method of claim 2, wherein supplying power using both the primary power system and a secondary power system further comprises supplying power to the at least one cooling system component using the primary power system and the secondary power system, wherein an amount of power supplied by the secondary power system is approximately equal to a power demand of the at least one cooling system component that exceeds a power demand of the at least one cooling system component operating at the operating level threshold.
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5. The method of claim 1, wherein power is supplied at a cheaper rate from the secondary power system instead of the primary power system.
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6. The method of claim 1, wherein the operating level threshold is associated with a power consumption efficiency of the at least one cooling system component.

7. The method of claim 1, wherein the operating level threshold is associated with an operating level of the at least one cooling system component whereby power consumption of the at least one cooling system component significantly increases relative to power consumptions at lower operating levels of the at least one cooling system component.

8. The method of claim 1, further comprising:
determining a power consumption of the at least one cooling system component at the operating level threshold;
determining a current power demand of the at one cooling system component;
and
supplying power to meet the power demand of the at least one cooling system component further comprises supplying power to meet the current power demand of the at least one cooling system component using both the primary power system and the secondary power system in response to the current power demand exceeding the power consumption of the at least one cooling system component at the operating level threshold.

9. The method of claim 8, wherein determining a power consumption of the at least one cooling system component at the operating level threshold comprises:
determining a power consumption of each of the at least one cooling system components at their respective operating level thresholds if the at least one cooling system component comprises multiple cooling system components; and

aggregating the power consumptions of the multiple cooling system components at their respective operating level thresholds.

5 10. The method of claim 9, wherein determining a current power demand of the at one cooling system component further comprises:

determining a current power demand of each of the multiple cooling system components; and

aggregating the current power demands of each of the multiple cooling system components.

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11. The method of claim 1, wherein the at least one cooling system component comprise one or more of at least one pump, at least one compressor, and at least one blower.

15 12. The method of claim 1, wherein the operating level threshold is associated with one or more of a first efficiency of one or more components in the primary power system and a second efficiency of one or more components in the secondary power system.

20 13. The method of claim 12, wherein the one or more components in either the first power system or the second power system comprises one or more of a power supply, a power distribution unit, an uninterruptible power source, and a power distribution system.

14. The method of claim 12, wherein the first efficiency and the second efficiency are based on one or more of a power factor and efficiency of the one or more components in the first power system and the second power system operating at different output powers.

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15. The method of claim 1, wherein supplying power to meet the power demand of the at least one cooling system component using one or more of a primary power system and a secondary power system based on whether an operating level of the at least one cooling system component exceeds the operating level threshold further comprises supplying power to meet the power demand of the at least one cooling system component using one or more of the primary power system and the secondary power system based on a cost of electricity from each of the primary power system and the secondary power system.

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16. The method of claim 1, further comprising:
determining whether a power demand of the at least one cooling system component exceeds an upper threshold or is less than a lower threshold; and
varying an amount of power supplied from one or more of the primary power system and the secondary power system in response to the power demand exceeding the upper threshold or the power demand being less than the lower threshold.

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17. The method of claim 16, further comprising:
determining whether the power demand of the at least one cooling system component is less than the lower threshold; and

increasing the power demand of the at least one cooling system component in response to the power demand being less than the lower threshold.

5 18. The method of claim 17, wherein increasing the power demand of the at least one cooling system component comprises migrating workload to at least one computer system being cooled by the at least one cooling system component.

19. The method of claim 16, further comprising:
determining whether the power demand of the at least one cooling system
10 component exceeds the upper threshold; and
reducing the power demand of the at least one cooling system component in response to the power demand exceeding the upper threshold for a predetermined period of time.

15 20. The method of claim 19, reducing the power demand of the at least one cooling system component comprises migrating workload from at least one computer system being cooled by the at least one cooling system component.

21. The method of claim 16, wherein the at least one cooling system component is
20 operable to provide an amount of cooling fluid for cooling at least one computer system based on an amount of heat dissipated by the at least one computer system.

22. The method of claim 1, wherein the primary power system includes a utility and the secondary power system includes one or more of a solar power source, fuel

cell, gas-powered power source, wind power source, and a hydroelectric power source.

23. The method of claim 1, further comprising:

5 determining whether the operating level of the at least one cooling system component exceeds an upper threshold or is less than a lower threshold; and
 placing one or more components of a computer system cooled by the cooling system in a lower-power state or a higher-power state in response to the operating level threshold of the at least one cooling system component exceeding the upper
10 threshold or being less than the lower threshold.

24. A system comprising:

 a first power system and a second power system operable to supply power to a
 at least one cooling system component;
15 a power delivery control device connected to the first power system and the second power system, wherein the power delivery control device is operable to control an amount of power supplied by the first power system and the second power system to the at least one cooling system component based on an operating level of at least one cooling system component.

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25. The system of claim 24, wherein the power delivery control device is further operable to control the amount of power supplied by the first power system and the second power system to the at least one cooling system component based on an

efficiency of one or more components in the first power system and the second power system.

5 26. The system of claim 25, wherein the one or more components comprises at least one of a power supply, a power distribution unit, and an uninterruptible power source, and a power distribution system.

10 27. The system of claim 24, wherein the power delivery control device is further operable to control the amount of power supplied by the first power system and the second power system to the at least one cooling system component based on an amount of power available from the second power system.

15 28. The system of claim 27, wherein the second power system is operable to supply at least a limited amount of power at a cheaper rate than the first power system.

20 29. The system of claim 24, wherein the power delivery control device is further operable to control the amount of power supplied by the first power system and the second power system to the at least one cooling system component based on a cost of electricity supplied by the first power system and a cost of electricity supplied by the second power system.

30. The system of claim 24, wherein the power delivery control device is operable to supply power to the at least one cooling system component using both the first power system and the second power system in response to a current operating level of

the at least one cooling system component exceeding an operating level threshold for the at least one cooling system component; and

the power delivery control device is operable to supply power using the first power system in response to the current operating level being below the operating level threshold.

31. The system of claim 30, wherein the operating level threshold is based on power efficiency of the at least one cooling system component.

32. The system of claim 30, wherein the operating level threshold is associated with an operating level of the at least one cooling system component whereby power consumption of the at least one cooling system component significantly increases relative to power consumptions at lower operating levels of the at least one cooling system component.

33. The system of claim 30, wherein an amount of power supplied by the secondary power system to the cooling system is approximately equal to a power demand of the at least one cooling system component that exceeds a power demand of the at least one cooling system component operating at the operating level threshold.

34. The power system of claim 30, wherein the power delivery control device is operable to receive the current operating level of the at least one cooling system component from a controller controlling the operating level of the at least one cooling system component, wherein the controller controls the operating level based on an

amount of heat dissipated by at least one computer system being cooled by the at least one cooling system component.

5 35. The power system of claim 34, wherein the power delivery control device is connected to a workload manager, and the power delivery control device is operable to request the workload manager to increase or decrease the workload of the at least one computer system cooled by the at least one cooling system component in order to increase or decrease a load on the at least one cooling system component.

10 36. The power system of claim 30, wherein the power delivery control device is operable to determine the current operating level of the at least one cooling system component based on a measured power consumption of the at least one cooling system component.

15 37. The system of claim 24, wherein the at least one cooling system component comprises a component in a refrigeration system, an air-cooled system, and a water-cooled system.

20 38. A power delivery control device controlling an amount of power supplied by a first power system and a second power system to at least one cooling system component, the device comprising:

 a memory configured to store at least one threshold associated with an efficient operating point of the at least one cooling system component; and

a power control circuit configured to compare one or more of power consumption of the at least one cooling system component and an operating level of the at least one cooling system component to the at least one threshold, wherein the power control circuit is further configured to control the amount of power supplied by the first power system and the second power system to the at least one cooling system component based on the comparison to the at least one threshold.

39. The device of claim 38, wherein the power control circuit is operable to receive an operating level of the at least one cooling system component from a controller controlling the operating level of the at least one cooling system component, wherein the controller controls the operating level based on an amount of heat dissipated by at least one computer system being cooled by the at least one cooling system component.

40. The device of claim 38, further comprising:
power measuring circuits for measuring an amount of power supplied by the first power system and an amount of power supplied by the second power system to the at least one cooling system component to determine the power consumption of the at least one cooling system component.

41. The device of claim 38, wherein the power control circuit is operable to control the amount of power supplied by the first power system and the second power system to the at least one cooling system component based on a cost of electricity supplied by each of the first power system and the second power system.

42. A system comprising:
- cooling system component means for cooling at least one computer system;
- means for determining an operating level threshold for the cooling system
- 5 component means, wherein the operating level threshold is one of a plurality of
operating levels for the cooling system component means; and
- means for supplying power to meet the power demand of the cooling system
- component means using one or more of a primary power source means and a
- secondary power source means based on whether an operating level of the cooling
- 10 system component means exceeds the operating level threshold.
43. The system of claim 42 further comprising:
- means for determining whether power is available from the secondary power
- source means; and
- 15 the means for supplying power is operable to supply power to the cooling
system component means using both the primary power source means and the
secondary power source means in response to power from the secondary power source
means being available and the operating level exceeding the operating level threshold.
- 20 44. The method of claim 42, further comprising:
- means for determining a cost of electricity from the primary power source
- means and the secondary power source means; and

the means for supplying power is operable to supply power to the cooling system component means based on the cost of electricity from the primary power source means and the secondary power source means.

- 5 45. The system of claim 42, wherein the operating level threshold is based on a power efficiency of the cooling system component means.